



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,951	08/18/2003	Richard E. Fontaine	09991-042001	4153
26161	7590	01/26/2006		
FISH & RICHARDSON PC P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
DATE MAILED: 01/26/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/642,951

Applicant(s)

FONTAINE ET AL.

Examiner

LAM S. NGUYEN

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/06/2005 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-6, 8-16, 20-21, 27, 30-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujii et al. (US 5668579).

Referring to claims 1, 13, 16, 27, 30, 33:

Suzuki et al. discloses an apparatus that is an ink jet print head (*FIG. 37*) comprising:

a plurality of droplet ejection devices (*FIG. 5: The array of ejection actuator 10 includes multiple actuators 27*), each said droplet ejection device including:

a fluid chamber (*FIG. 37, element 6*) having a volume and an ejection nozzle (*FIG. 37, element 4*),

an electrically actuated displacement device either is a piezoelectric

Art Unit: 2853

actuator (column 1, lines 39-52) or a diaphragm (*FIG. 37, elements 5, 21*) that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance (*FIGs. 7, 7A, element 5*) associated with the electrically actuated displacement device changes in charge between an actuated condition and an unactuated condition (*FIG. 35:*

The displacement of diaphragm 5 is associated with the capacitance), and

a first switch (*FIG. 7, elements 42*) that has a first input connected to an electric source terminal (*FIG. 7: The first input is the emitter of transistor 42, that is connected to the voltage source V_{cc}*), a first output connected to said electrically actuated displacement device (*FIG. 7: The first output is the collector of transistor 42, that is connected to the actuator 5 through resistor 43*), and a first control signal input (*FIG. 7: The first control signal input is the base of transistor 42, that is connected to the signal input 51*) to determine whether said first input is connected to or disconnected from said first output (*FIG. 7: When the input signal 51 is high/low, transistor 42 is ON/OFF to connect/disconnect the voltage source V_{cc} to the actuator 5*), wherein an applied electric source distributes a constant voltage electrical signal to said first inputs of said plurality of droplet ejection devices (*FIG. 7, element V_{cc}*), and

a controller (*FIG. 5, element 62*) that provides respective charge control signals to respective said first control signal inputs (*FIG. 5-6: The controller 62 provides control signals to the charge circuit 64 and the discharge circuit 65 through the timing pulse generation means 63*) to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIGs. 7, 11: The charge signal controls the charge time period t_{10} - t_{11} in which the transistor 42 connects the voltage source V_{cc} to the actuator 5*) and to set a constant

Art Unit: 2853

amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said electrically actuated displacement device, wherein the disconnection maintains a constant voltage on respective said capacitances by the storing the constant amount of charge on respective said capacitances (*FIGs. 7, 11: During the "hold" period, even though transistor 42 disconnects the voltage source V_{cc} and the actuator 5, the charge V_1 is constantly maintained. Note that since resistor 47 has a sufficient high resistance value, the resistor has little influence during the charge and discharge process (column 15, lines 58-67)*).

wherein each of said plurality of droplet ejection devices is configured for individual control of charge accumulation (magnitude) on respective said capacitances and for individual control of the extent of change in charge on respective said capacitances (*FIG. 5-6: The charge magnitude and the charge time period of each ejection actuator 27 in the array 10 is individually driven/controlled by the charge circuit 64 of an associate driver 40*).

Referring to claims 2, 34: wherein said electrically actuated displacement device moves between a displaced position and an undisplaced position as a capacitance associated with the electrically actuated displacement device changes between a charged, actuated condition and an uncharged, unactuated condition, and wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 7: The input signal 51 is provided to turn on transistor 42, then the ON state of transistor 42 connects the voltage source to the actuator*).

Referring to claims 3, 15, 31, 35: wherein each said droplet ejection device also includes a second switch (*FIG. 7: Transistor 45*) that has a second input connected to a discharging electrical terminal (*FIG. 7: The emitter of transistor 45*), a second output connected to said electrically actuated displacement device (*FIG. 7: The collector of transistor 45*), and a second control signal input (*FIG. 7: The base of transistor 45*) to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances (*FIG. 6-7: The controller 62, through the timing pulse generator 63 sends the discharge signal to the input 52 of the discharge circuit 65*),

and wherein each of said plurality of droplet ejection devices is configured for individual control of the discharge of the charge on respective said capacitances (*FIG. 5-6: The discharge process of each ejection actuator 27 in the array 10 is individually driven/controlled by the discharge circuit 65 of an associate driver 40*).

Referring to claims 4-5, 6: wherein each said droplet ejection device comprises a first resistance (*FIG. 7, element 43*) between said electric source and said electrically actuated displacement device and is external of an electrical path from said electrically actuated displacement device to said second switch, and wherein each said droplet ejection device comprises a second resistance (*FIG. 7, element 46*) between said discharging electrical terminal and said electrically actuated displacement device.

Referring to claim 8: wherein a plurality of resistors (*FIG. 7A: All resistors associate to transistor 108 and switch 106*), voltages (*FIG. 7A: The voltage source, ground, and the input*

Art Unit: 2853

voltage) and switches (*FIG. 7A: Switches are element 106 and transistor 108*) are connected to each said electrically actuated displacement device and controlled by said controller to change the charge on said capacitance.

Referring to claim 9: wherein said discharging electrical terminal is at ground (*FIG. 7: The emitter of transistor 45 is connected to ground*).

Referring to claims 10-12: wherein said electrical signal is a controlled or constant voltage/current signal (*column 18, lines 8-12: The power supply source is controlled to regulate the voltage of current*).

Referring to claim 14: wherein said first control signal terminates the connection of said constant voltage to said electrically actuated displacement device when the charge on said electrically actuated displacement device is at a predetermined value which is less than said constant voltage (*column 18, lines 20-35: The voltage charge V_a is less than the voltage source V_s*).

Referring to claim 32: wherein the amount of charged on the capacitance is greater in the actuated condition than the amount of charge in the unactuated condition (*FIG. 11: The area covers by the curve V_I associates with the "charge" period is larger than that of the "discharge" period*).

Referring to claim 20: wherein said first and second control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices for respective predetermined times (*FIG. 11: The first and second control signals correspond the "charge" and "discharge" time period, respectively*).

Referring to claim 21: wherein respective said first control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices until respective said electrically actuated displacement devices achieve respective predetermined charge voltages (*FIG. 11: The charge voltage is predetermined by defining the width of the "charge" period*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 7, 17-19, 22-26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 5668579) in view of Murakami et al. (US 4563689).

Fujii et al. discloses the claimed invention as discussed above except wherein a single resistance is used to charge and discharge a respective capacitance (**Referring to claims 17-19**). Fujii et al. is also silent wherein said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices or to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide pay scale control (**Referring to claims 17-19**), wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (**Referring to claims 22-23**), wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding (**Referring to claims 24-25**), wherein said

Art Unit: 2853

first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said electrically actuated displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (**Referring to claim 26**), and wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency (**Referring to claim 29**).

Murakami et al. discloses an ink jet printing apparatus having a driving circuit for controlling the charge/discharge on an actuator having an associated capacitance to cause the actuator to displace for ejecting ink purpose (*FIG. 7, element 7*), wherein the driving circuit includes switches, voltages, and at least one resistor that is used to charge and discharge the actuator (*FIG. 7, element 6*), and a controller for providing control signals to provide uniform or different droplet volumes or velocities from said plurality of droplet ejection devices so as to provide pay scale control (*column 3, lines 1-7, lines 65-68: Since the ink droplet size can be freely changed, the drop volumes can be controlled to be uniform or at predetermined value*), to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (*column 4, lines 13-17: Said preceding pulse not having enough energy for the ink to be ejected from the nozzle*), to provide inject noise into images being printed so as to break up possible print patterns and banding (*column 2, lines 37-40: The noise is the satellite droplets*), to vary the amplitude of charge as well as the length of time of charge on said electrically actuated displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (*column 6, lines 20-25: Changing the pulse height and width of the pulse*), and to control a first switch as a function of the frequency of

Art Unit: 2853

droplet ejection to reduce variation in drop volume as a function of frequency (*column 6, lines 20-25*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the controller disclosed by Fujii et al. to be able to provide control signals that provides uniform or different droplet volumes or velocities as disclosed by Murakami et al. The motivation for doing so would have been to effect high-quality halftone-gradation recording as taught by Murakami et al. (*column 3, lines 60-63*).

3. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 5668579) in view of Murakami et al. (US 4563689), as applied to claims 1 and 13, and further in view of Imanaka et al. (US 6467863) and Butterfield et al. (US 6685297).

- Fujii et al., as modified, discloses the claimed invention as discussed above except wherein said controller mounted to a monolithic body in which said fluid chambers are formed.

Imanaka et al. discloses an ink jet recording head having a controller (*FIG. 4B, element 46*) mounted on a circuit board (*FIG. 4B, element 33*) that a plurality of ink chambers are formed (*FIG. 4B, element 9 or 7a*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the circuit board of the print head disclosed by Suzuki et al. to include also the controller as disclosed by Imanaka et al. since this is a common technique well known in the art to eliminate the wire connection between the recording head and the controller in order to avoid any problem caused by the wire connection.

- In addition, Fujii et al., as modified, and Imanaka et al. do not disclose wherein the controller includes a field programmable gate array.

Butterfield et al. discloses a printing apparatus having a controller that can be a microprocessor based device programmed in a desired manner such as a field programmable gate array (*column 3, lines 6-12*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the controller disclosed by Suzuki et al. in view of Imanaka et al. to be an field programmable gate array as disclosed by Butterfield et al. The motivation for doing so would have been to be able to program the operation of the controller in a desired manner as taught by Butterfield et al. (*column 3, lines 6-12*).

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

Art Unit: 2853

system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN

01/18/2006

Hai Pham
HAI PHAM
PRIMARY EXAMINER